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ABSTRACT

The container shipping industry has entered a period of rapid change and adjustment. Some of the most significant developments have been the formation of a number of strategic alliances and equity mergers. These have produced a major overhaul of service networks. Indeed, the opportunities of rationalising vessel deployments are one of the advantages claimed for sharing or merging fleets that are increasingly expensive to operate in a global market. This paper investigates how the carrier groupings have undertaken adjustments in their services, and what have been the effects on the selection of ports of call. These change are transforming spatial relations. The paper considers the adjustments in the context of globalisation and explores how the container shipping industry is becoming more homogeneous in its spatial alignments while at the same time is undergoing convulsions in port selection.

Key words : maritime transport, container, alliances, port

RÉSUMÉ

L'industrie du transport maritime de conteneurs a entrepris une période de changements rapides. Certains des développements les plus significatifs reposent sur la formation d'alliances stratégiques et de fusions d'entreprises. Cette démarche a produit une révision profonde des réseaux de service. En effet, l'opportunité de rationaliser le déploiement des navires est l'un des avantages mentionnés pour le partage ou la fusion des flottes maritimes qui sont de plus en plus onéreuses à opérer au sein des marchés internationaux. Ce manuscrit vise à comprendre comment les regroupements entre transporteurs ont entraîné une révision de leurs services et quels sont les impacts sur la sélection des ports d'appel. De toute évidence, ces changements transforment profondément les relations spatiales. Le texte considère ces révisions dans le contexte de la globalisation et explore comment l'industrie maritime du conteneur devient de plus en plus homogène dans sa stratégie géographique alors qu'on assiste à une modification dans la sélection des ports d'appel.

Mots clés : transport maritime, conteneur, alliances, port

INTRODUCTION

The container shipping industry has entered a period of rapid change and adjustment, notably the drawing together of many carriers. While a degree of cooperation and association between carriers in the container shipping industry has always existed, in the latter part of the 1990s there occurred a significant *rapprochement* of most of the major actors. There have been a number of multi-national mergers involving complete financial integration, such as between the British-based P&O and the Dutch line Nedlloyd, and the acquisition of the US line APL by NOL of Singapore. Of wider significance has been the establishment of global alliances, of which five are the most important: SeaLand-Maersk, the Grand Alliance (Hapag-Lloyd, P&O-Nedlloyd, MISC, NYK, OOCL), the United Alliance (Hanjin, DSR-Senator, Cho Yang), the New World Alliance (HMM, APL, MOL), and the grouping of COSCO, Yangming and K-Line.

The academic literature is still absorbing the implications of the groupings. As in the literature on alliances in the economy in general, there is no clear consensus as to the economic justification for the recent formation of groupings in container shipping industry. Two broad approaches have been used. The economics literature focuses on internalisation theories, where firms are seen to seek to minimise transaction costs (Williamson 1985). The other approach is based on strategic management theory, in which firm performance is considered to be shaped by a number of factors, internal and external (Porter 1986). Questions about the stability of the alliances have been considered, with a suggestion that they are inherently unstable (Midoro and Pitto 1999). The relative merits of acquisitions against alliances have been considered in several studies. The evidence points towards equity mergers providing greater possibilities of integration, as manifested by the eventual merger between Maersk and SeaLand, erstwhile partners in an alliance, and by the policy of CP Ships, standing apart from alliance membership, yet acquiring control over half a dozen smaller carriers in its attempt to become one of the top ten container lines (Brooks 2000; Alix ,Slack and Comtois 1999).

In operational terms both alliances and mergers have produced a transformation of service networks. Indeed, the opportunities of rationalising vessel deployments are one of the advantages claimed for sharing or merging fleets that are increasingly expensive to operate in a global environment. In a companion paper (Slack, Comtois and McCalla 2001) we have demonstrated that the intensity and frequency of container shipping services have changed as a direct result of the groupings. For example we have reported that the number of shipping services mounted by alliance members have increased by one third between 1989 and 1999, and the mean vessel size has grown by 40 per cent. Other adjustments, such as the configuration of routes, are spatial in character, but the actual form and character of these changes are not well understood. This paper investigates the spatial restructuring at two different scales. First, we examine the changes to the geography of the networks that have come about as a result of the formation of the alliances. We compare the broad market coverage provided by the services of carriers before and after alliance membership. Second, we examine the effects of the changing networks on ports. We detail the changing patterns of port selection that have resulted from the establishment of joint services. Inevitably, our review is broad

brush but the evidence presented allows us to draw conclusions about how the container networks have changed as a result of the alliances, and how shipping services and globalisation are linked in a symbiotic relationship.

METHODOLOGY

Containerisation International Yearbook was used as the main data source. As a commercial handbook, dependent upon the submissions of information from the shipping lines themselves, its reliability and comprehensiveness may be questioned. It is, however, the only source of its type that provides a global statement of record of the industry. Having been published for 35 years, The *Yearbook* has built up a good record of credibility and usefulness. Data were drawn for three years: 1989, 1994 and 1999. The 1999 Yearbook was the most recent annual available when the study began. 1989 was selected as a base year, since it was well prior to the spate of alliance formation. 1994 was a year at the cusp, when the alliances were just beginning to be established, but when the service changes etc. were rather indeterminate.

Since the purpose of the study is to examine the effects of alliances on services, we drew data from the three *Yearbooks* for those carriers that were members of one of the five alliances in place in 1999. The sample includes most of the major container shipping lines of the world, but it excludes several important carriers: Evergreen, MSC, CGM, Hamburg Sud, CP Ships, companies that have remained largely outside the alliance groups.

Data on the services offered by the lines and by the alliances were collected. These include the frequency of service, the ports of call, and the number and capacity of ships on each service. These were tabulated for each shipping company for the three selected years, and for the alliances for 1999. It must be mentioned that all companies offer services independent of the alliances of which they are members.

THE GEOGRAPHY OF CONTAINER SHIPPING SERVICES

The network geometry of container shipping services is complex. As Pearson and Fossey (1983) demonstrated, the standardisation of cargo handling that containerisation ushered in did not extend to the configuration of shipping services. The hub and spoke network structure that was expected to develop when containers first appeared, and which has come to dominate airline services, did not take hold. Pearson and Fossey (1983) identified 17 different configurations of container services. Subsequent analysis indicated that up until the beginning of the 1990s the dominant service morphology was a range-to-range pattern, in which three routes dominated: Europe-North Asia, Europe-East Coast North America, and West Coast North America-North Asia (Slack 1995; Fiore1986). At odds with this dominant pattern were the round-the-world services operated by Evergreen (Lim 1996).

Our analysis of the shipping services of begins in 1989, several years prior to the formation of the alliances. Since previous studies had indicated the pre-eminence of range-to-range networks, we begin by considering the services based on the market regions served, ignoring for the moment the actual ports of call. The world was divided into 13 major market regions, each corresponding to a well-recognised maritime range. The slot-capacity allocated by each company to each market was calculated, by identifying which ships were used in the various trade routes. In the diagrams produced the thickness of the lines is proportionate to the capacity allocated to the route. It must be recognised that this is a rather crude estimate if more than two ranges are involved, since we arbitrarily divided the total slot capacity by the number of ranges regardless of the actual availability. This was particularly problematical for the round-the-world services, where the total capacity is divided by the number of ranges served. Furthermore, several companies in 1999 did not specify completely the regional deployment of their vessels. For these reasons the capacity data are used for illustrative purposes only.

There are three broad features that stand out from analysis of the shipping service configurations for 1989. Foremost is the differential concentration of services and capacities of the carriers. Except for NYK and Nedlloyd, all companies maintain services that are regionalised, and with the exception of Maersk are based largely on nationality. The Asian carriers maintain services that are oriented to North and East Asia, while the European carriers, with the exception of Maersk, have an emphasis on services focussed on North-West Europe. Similarly, the American carriers are weighted towards East and/or West Coast markets (see Fig 1).

(INSERT FIGURE 1)

A second feature of the 1989 service structure is the general simplicity of the services. Most are range-to-range. This is particularly evident if North, East and South-East Asia are combined and treated as one range. The number of services that extend beyond two maritime ranges is very small (see Fig 2). The third feature of the 1989 services is the heavy allocation of capacity to the main markets of North-West Europe, North America and North and East Asia. The pre-eminence of the East-West trades is evident. Lesser markets have few services and the slot capacity allocation is markedly inferior.

(INSERT FIGURE 2)

Table 1 indicates that there were significant differences between companies in their market coverage in 1989. From a low of 4 ranges served in the case of Hanjin and APL, to a full complement of 13 ranges for Nedlloyd, there is a wide variation, with an average of 7.3 regions served. These results confirm that most container shipping services in 1989 were regionally concentrated.

By 1994, a number of changes are noticeable. A bifurcation of service networks occurred. Five lines, Maersk, APL, Cho Yang, Hanjin, and DSR expanded their operations into new markets. In the case of DSR and Cho Yang this was achieved by adopting a round-the-world service (see Fig 3).

For Hanjin and APL, the changes were prompted by the companies entry into established markets such as South Asia and Europe (see Fig 4). Maersk, on the other hand, was embarking on an ambitious expansion programme that was to propel it as the industry leader. These companies joined Nedlloyd and NYK as global container shipping providers. While DSR and Senator copied Evergreen's service configuration, the global expansion of other lines was marked by the appearance of new service network structures. They took many forms, but increasingly services were multi-range (see Fig 4 Hanjin). Maersk developed a set of overlapping multi-range services that provided extensive regional coverage, without the disadvantage of the RTW of having to call in lesser markets as part of the mainline service. It led to the establishment of several transfer points, some of which, like Algeciras, did not generate any traffic of their own. These pivot ports mark a new dimension in container shipping services. Another innovation at this time was the pendulum service between three or more ranges.

(INSERT FIG 3 AND 4)

Several other shipping companies had reduced their market coverage by 1994 (see Table 1). K-Line, Yangming, MOL, HMM and Hapag Lloyd withdrew from at least one market. This trend resulted in a concentration of services of these firms on the larger ranges. For the other six firms the changes of service configuration and market coverage were minor.

1994, therefore, marks a period of adjustment and further differentiation. The average number of ranges served increased from 7.3 to 8.2, and clearly the industry is being drawn into developing a new set of service configurations. Some companies responded by aggressively expanding their coverage and adopting new service configurations (such as Maersk), others, such as DSR, followed Evergreen's model of providing a broad global coverage. The pressures of globalisation were evident in the industry in 1994, but many companies sought initially to concentrate their activities in the markets in which they had a strong presence, or maintain the status quo.

TABLE 1 NUMBER OF MARITIME RANGES SERVED BY ALLIANCES MEMBERS, 1989-99

Company	1989	1994	1999
Grand Alliance			10
MISC	5	5	6
NYK	11	12	13
Hapag-Lloyd	12	8	12
P&O	10	10	13
Nedlloyd	13	13	13
OOCL	9	9	11
New World Alliance			8
HMM	6	5	8
APL	4	6	12
NOL	9	7	
MOL	10	9	13
United Alliance			11
Hanjin	4	7	11
Cho Yang	6	9	11
DSR	6	9	11
Senator	7	10	
Maersk	10	13	13
SeaLand	7	10	
K-Line	10	9	9
Yangming	9	7	10
COSCO	11	10	11

Source: *Containerisation International Yearbooks, 1989-1999*

During the period 1994-9 the shipping industry underwent an unprecedented internal restructuring, there were three equity mergers involving companies in the sample (DSR-Senator, NOL-APL, P&O-Nedlloyd), other equity involvements (Hanjin's acquisition of 85 % of DSR-Senator) and the establishment of five alliance groupings. While these changes precipitated an upheaval in organization, the effects on operations in 1999 were to produce the growing conformity of shipping services. This is reflected in the ranges served (see Table 1). The mean number of ranges served per company rose from 8.2 in 1994 to 10.3 in 1999. Services became more extensive. Companies that had a wide market coverage in 1989 such as P&O, MOL, and Maersk, became global operators (see Fig 5), and others that were more regionally-based in 1989, such as APL, Hanjin, HMM, also emerged as world players (see Fig 5).

(INSERT FIG 5)

Alliance membership has in every case but one (MISC) facilitated the expansion of services. The alliance sailings permitted many carriers to enter markets that they could not serve independently. Thus, HMM gained access to ECNA and the Caribbean as a result of its membership in the New World Alliance. Through its acquisition by NOL and its membership in the New World Alliance APL now provides service to Europe. In a similar fashion, P&O through its merger with Nedlloyd and membership in the Grand Alliance is involved in services to the West Coast of North America for the first time (see Fig 6).

(INSERT FIG 6)

It should be noticed that the alliance services form an integral, though by no means complete, part of the services of member carriers. These alliance services tend to be between the major trading blocks (see Table 2), and because of pooling of resources deploy the largest capacity ships. This has permitted the individual members to mount separate or joint services into lesser markets, thereby enhancing further the global character of container shipping. The industry is penetrating new markets. Services to South and Central America have been forged and extended. In addition, the industry is developing new feeder services, especially in Asia, and in the Mediterranean a new hub structure was established, based on new pivot ports in the southern basin (Zophil and Prijon 1999). While the industry is still dominated by the East-West trades, a more North-South alignment is becoming evident.

THE CHANGING PATTERNS OF PORT SELECTION

The choice of ports of call is directly related to how the carriers seek to exploit markets. The changes made to container shipping networks over the last decade of the Twentieth Century inevitably impact on port selection. The formation of the alliances and the equity mergers can thus have been expected to precipitate readjustments of port services. Expansion into new markets brings with it the invariable addition of new ports, but even on ranges where service is being maintained,

new joint services have the potential to bring about a rationalisation of port selection. In this section we describe the changes in port connections that occurred between 1994 and 1999, and try to discern what impact the alliances had on the process.

Table 2 lists the ports of call involved in the joint services of the three of the strategic alliances. The K-Line- COSCO-Yangming grouping is excluded because it is a very loose association, and Maersk-SeaLand is omitted because its services represent the almost complete integration of those of the partners. Because members of the retained alliances offer joint as well as independent services, it is possible to explore more fully the issue of the effects of alliances on port selection. As inferred above, the alliance services are concentrated on the main market ranges. It is also evident that the alliances have sought to provide services to each range by selecting several of the largest ports. Multi-port services are thus the feature of alliance operations on each range.

The results of the analysis clearly demonstrate that the late 1990s were a period of significant change and adjustment for the carriers services. The most impressive feature of the summaries of the changes (see Table 3) is the scale and magnitude of the shifts in ports of call that took place in a very short time. All companies experienced a large adjustment in port services coinciding with the establishment of the alliances. However, the character of the changes differed between the carriers. Some companies, such as APL and MISC, greatly enlarged their port networks, while others, such as MOL and Hapag-Lloyd, experienced some retrenchment. There is no consistency within alliance structures, with some members expanding the number of ports of call, and others reducing service.

Some of the changes are very striking. In a five year period, HMM added 43 new ports to its schedule, while maintaining service to 24 and dropping only 10 ports. A similar pattern is repeated by OOCL. Conversely alliance co-member, MOL ceased service to 57 ports, while adding only 47.

Companies that underwent equity mergers during the period as well as alliance membership experienced some of the largest adjustments. P&O added 106 ports to its network and APL added 71, both increases being greater than the number of ports retained between 1994 and 1999, and DSR added 29 ports. This leads to the question of whether the mergers led to the increases. In the case of P&O, it appears that the merger with Nedlloyd was an important factor in the addition of ports, because Nedlloyd had served 60 of the 106 new additions previously. On the other hand, for APL only 8 of its new ports had been served by previously by NOL, and in the case of DSR, none of the new additions were previously served by Senator. This suggests that the mergers themselves did not always bring about change.

TABLE 2 PORTS IN ALLIANCE SERVICES, 1999

NEW WORLD ALLIANCE	GRAND ALLIANCE	UNITED ALLIANCE
NORTH EUROPE:		
Antwerp, Bremen, Felixstowe, Hamburg, Le Havre, Rotterdam, Southampton	Antwerp, Bremen, Hamburg, Le Havre, Rotterdam, Southampton, Thamesport	Antwerp, Bremen, Felixstowe, Hamburg, Le Havre, Rotterdam, Thamesport
MEDITERRANEAN :		
	Barcelona, Damietta, La Spezia, Marsaxlokk, Marseille	Giao Tauro, La Spezia, Marseille, Valencia
MIDDLE EAST:		
	Dubai, Jeddah	Dubai, Jeddah, Khor Fakkan
SOUTH ASIA:		
Colombo, Laem Chabang, Port Kelang, Singapore	Colombo, Laem Chabang, Port Kelang, Singapore	Colombo, Port Kelang, Singapore
EAST ASIA:		
Hong Kong, Kaohsiung, Kwangyang, Qingdao, Shanghai, Yantian	Hong Kong, Kaohsiung, Qingdao, Shanghai, Shekou, Yantian	Hong Kong, Kaohsiung, Qingdao, Shanghai, Xingang
NORTH ASIA		
Busan, Hakata, Kobe, Nagoya, Shimizu, Tokyo, Yokohama	Busan, Hakata, Kobe, Nagoya, Sendai, Shimizu, Tokyo, Yokohama	Busan, Kobe, Nagoya, Osaka, Tokyo, Yokohama
WEST COAST NORTH AMERICA:		
Dutch Harbor, Long Beach, Los Angeles, Oakland, Portland, Seattle, Vancouver	Long Beach, Los Angeles, Oakland, Seattle, Vancouver	Long Beach, Oakland, Portland, Seattle, Vancouver
EAST COAST NORTH AMERICA:		
Charleston, New York, Norfolk	Charleston, Halifax, New York, Norfolk, Savannah	Norfolk, New York, Savannah
CENTRAL AMERICA:		
Puerto Manzanillo	Puerto Manzanillo	Puerto Manzanillo

Source: *Containerisation International Yearbooks*

TABLE 3 TURNOVERS OF PORTS IN THREE ALLIANCE NETWORKS, 1994-1999

Carrier	# dropped	# continued	of which are alliance ports	# added	of which are alliance ports	of which are from merged partner
HMM	10	24	21	43	16	n.a
APL	6	35	19	71	18	8
MOL	57	92	29	47	8	n.a.
P&O	14	89	29	106	14	60
NYK	41	112	34	30	9	n.a.
Hapag	31	67	30	20	13	n.a.
MISC	6	42	21	29	14	n.a.
OOCL	11	39	26	49	17	
DSR	25	58	27	29	11	0
Hanjin	2	25	21	35	16	n.a.
Cho Yang	8	33	27	32	10	n.a.

Source: *Containerisation International Yearbooks*

There appears to be two elements regarding the effects of the alliances on port selection. First, in every case the majority of the ports included in alliance networks were previously called at by the individual carriers. For the Japanese carriers, that were already offering services to a wide spectrum of ranges, the alliance-ports were overwhelmingly part in their existing networks. For HMM, APL, MISC, DSR, Cho Yang, OOCL and Hanjin the alliance ports represented at least half the ports for which service was maintained between 1994-9, and in the case of Hanjin and HMM nearly all the retained ports were those that were part of alliance services.

The second aspect of the alliances is that they helped open up new markets in two ways. First, they provided every member with additional market coverage, and all the carriers added ports of call that were components of alliance networks. Examples are numerous, including MISC accessing the East Coast of North America, DSR the WCNA, APL Europe, Hapag Lloyd the Far East, P&O the Pacific North-West. Of particular interest is the way the alliance services enabled carriers to tap directly into the Chinese market, replacing earlier networks based entirely on transhipments via Hong Kong (Wang and Slack 2000). Second, by providing members with joint services to the major markets, carriers could develop individual services into other ranges. Thus, during the latter half of the 1990s

occurred a restructuring of services, such as MOL in Japan, or an extension of new services to the lesser markets, such as MISC into Australia.

DISCUSSION

The results described here provide some indication of the effects of alliances on shipping services. While our compilations have produced a great deal of detailed information about individual companies and their services over a ten-year period, two main themes may be extracted. Of basic significance is the diversity of the firms that have come together in various forms during the review period. Differentiated by nationality, capitalisation, and capacity, the container shipping companies of 1989 served different markets in different ways. Most were regionally concentrated, operating range-to-range services between ports on the East-West trades. In coming together through mergers and membership in strategic alliances, there has been a marked tendency for the services to become more similar. The former regional market differences have diminished, as all the companies are now serving most market areas in the world. There are still some differences in the relative capacity allocations to the different markets, but there is far greater conformity of market coverage in 1999 than in 1989.

Conformity is an expected outcome of globalisation. Companies serving global markets adopt standardised operational and marketing procedures that allow them to carry on business in disparate regions (Dicken 1998). In the case of the container shipping industry the relationship may be seen as bi-directional. Providing transportation services across the world's oceans has necessitated constructing networks that are interlinked, using comparable vessels in similar market places, employing common handling operations, and applying standardised information and documentation processing systems. These developments in the container shipping industry, in turn, help shape globalisation itself. Intensifying services between the main markets, extending container services into smaller markets that used to be outside main intermodal networks have greatly enhanced international trade and investment that are essential features of globalisation.

It is difficult to ascribe the changes in service networks reviewed in this paper to the alliances explicitly. Service reconfiguration was taking shape by 1994, and while the transformation has been extended since the alliances were formed, the multi-range services and the expansion of feeder services are seen more properly as signs of adjustments to global trade developments. Certainly, the costs of providing these new services and the increasing scale economies involved in the deployment of new vessels were important factors inducing companies to merge and join alliances, but the causal link between alliances and network re-configuration is not direct.

While container shipping services were becoming more similar, there occurred a massive change in the selection of ports of call. All the companies that joined alliances underwent very large turnover in port service calls between 1994-9. They all were shedding ports from their networks, while at the same time adding many new calls. This produced a radically different set of ports of call in each carrier's services by the end of the period of study. These changes can be ascribed directly to the alliances. The groupings forced the companies to rationalise and integrate services, and thus

required a greater coordination of port selection for the mainline alliance services. At the same time the cooperation freed resources that provided opportunities to enter new markets outside the alliance structure or serve existing markets in different ways.

The radical changes in the ports of call paradoxically contributed to the growing similarity between the separate companies. The core services of the different alliances use many of the same ports. The differences in the ports of call of the alliances listed in Table 2 are surprisingly few. Not only are the alliance carriers serving the same ranges, but they are also calling at the same set of ports on each range. Differences occur in the non-alliance services and in the feeder networks, but even here port selection is quite uniform. The explanation is that globalisation forces the companies to have a presence in every major world market, but that within many of these markets the availability of ports with adequate facilities, suitable draughts of water, and acceptable operational conditions is limited. The global carriers thus end in serving the same ports. This feature help explains a paradox discussed in the companion paper (Slack, Comtois and McCalla, 2001). If the numbers of ports each carrier served in 1989, 1994 and 1999 are totalled (regardless of where they are), it is shown that there has been a marked increase. Yet, if the number of different ports served by the carriers is added together, no change is recorded. As suggested in the companion paper, and substantiated here, the carriers are expanding their operational networks, but they are tending to use the same set of ports.

CONCLUSION

Globalisation has contributed to the remaking of container shipping networks of many of the largest carriers. The imperative of serving markets in all parts of the world has forced the carriers to extend and reconfigure their services. Yet in so doing the differences between the lines have diminished, and globalisation appears to be imprinting a great deal of conformity on the industry. This conformity is being accentuated by the creation of alliances, because of the common alliance services, and because the alliances themselves are serving the same market regions. It must be recognised that we have only examined the networks of alliance members. It will be interesting to compare these mega carriers with other container shipping operators, many of who are still regional in scope (Robinson, 1998).

The scale and scope of changes in port selection by alliance members represent one of the most remarkable developments in container shipping over the last five years. While services have been restructured the changes have been amplified at the level of the individual ports. All the carriers have used the alliance membership as a means of coordinating services many of which have involved new ports of call. At the same time, companies have been afforded opportunities to expand services outside the alliance structure. Again, it would be interesting to see if the non-alliance container carriers have experienced the same rates of turnover in ports of call as the alliance partners.

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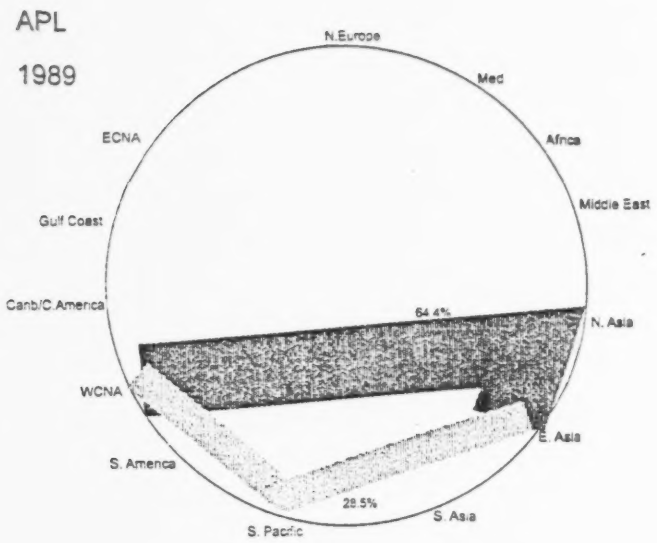


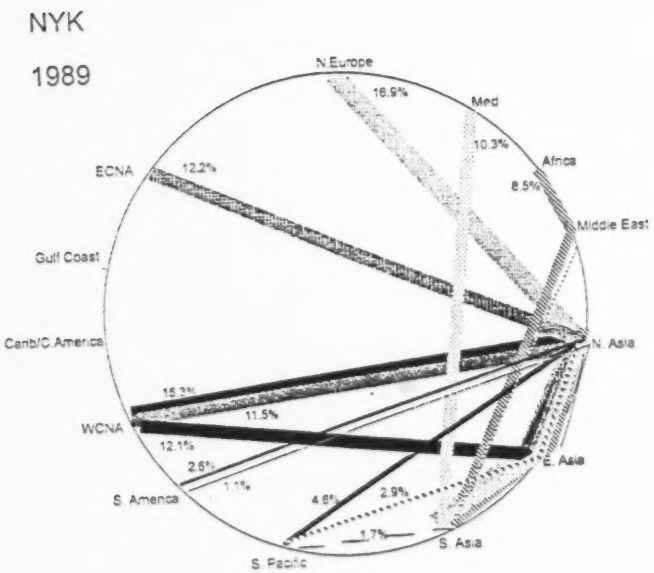


Fig. 1 Regional/national concentration of container shipping services 1989

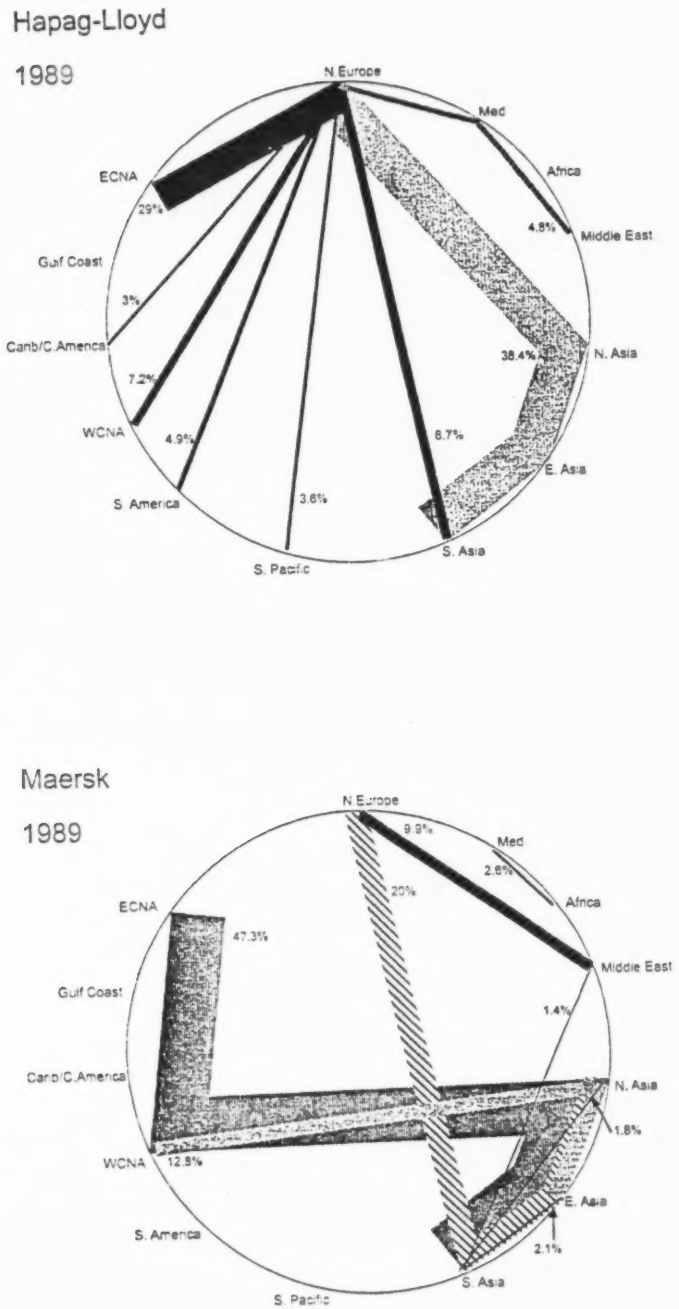


Fig. 2 Range-to-range services and the dominance of East-West Trade routes

DSR

1994

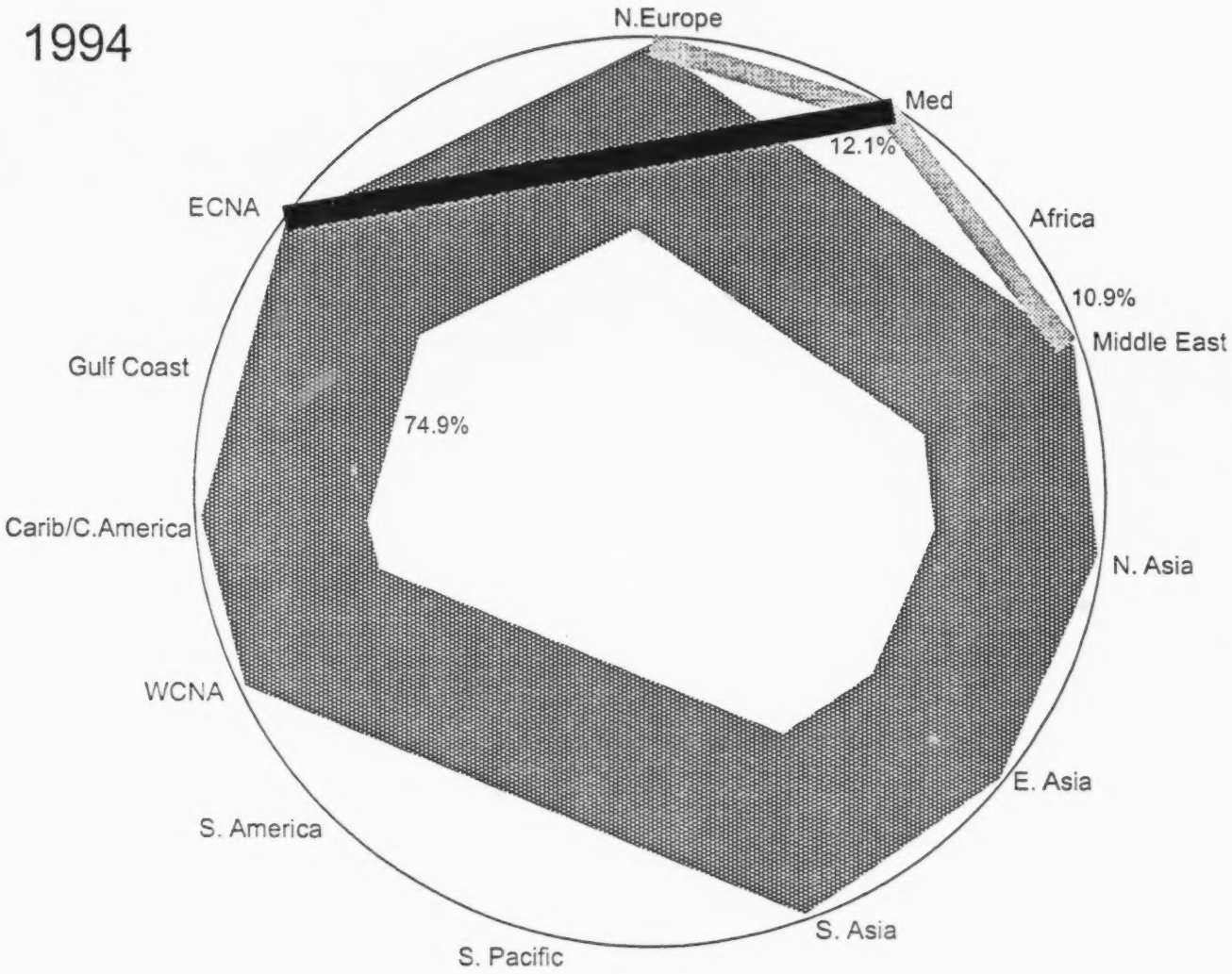


Fig. 3 Round-the World services

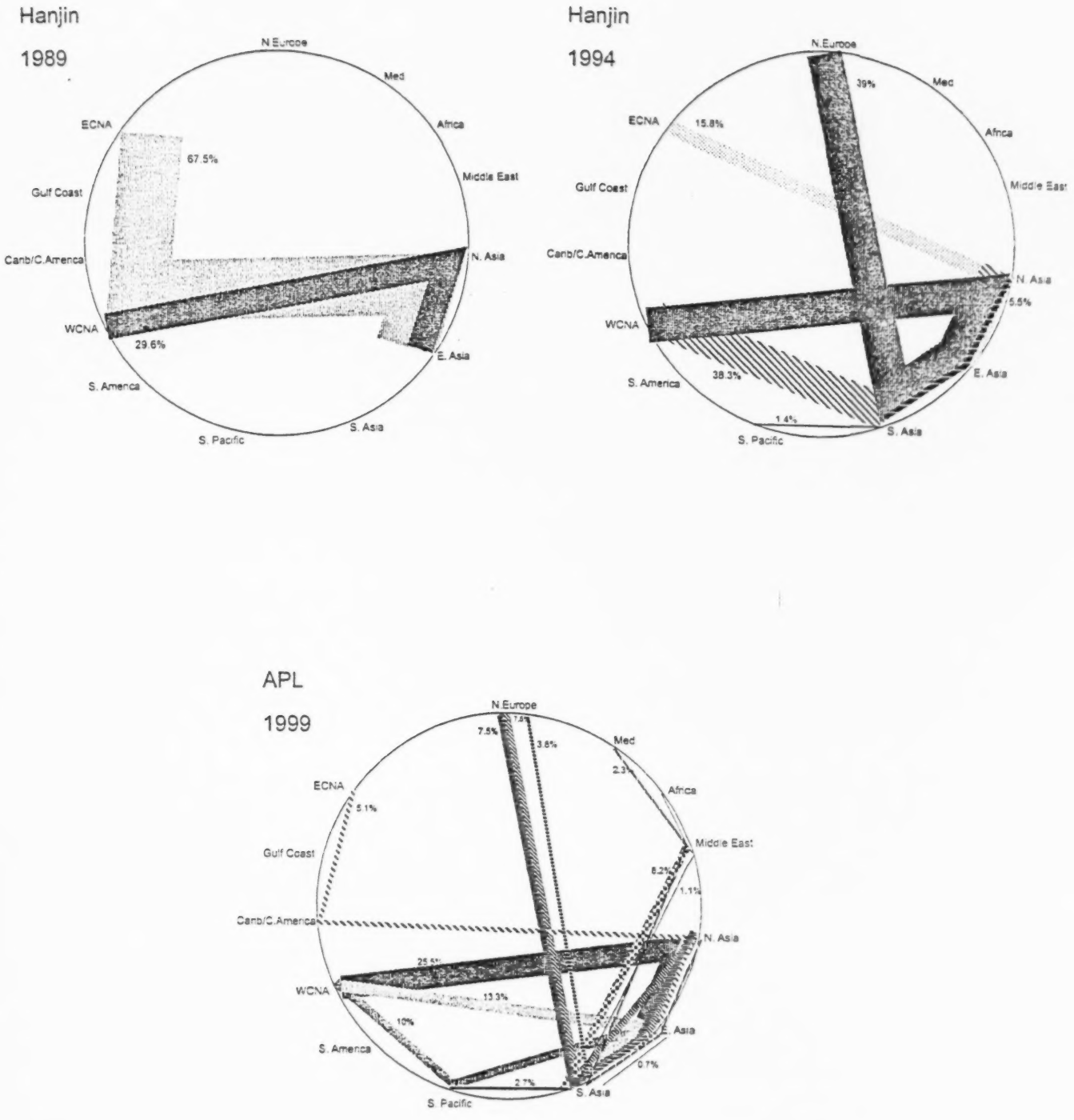
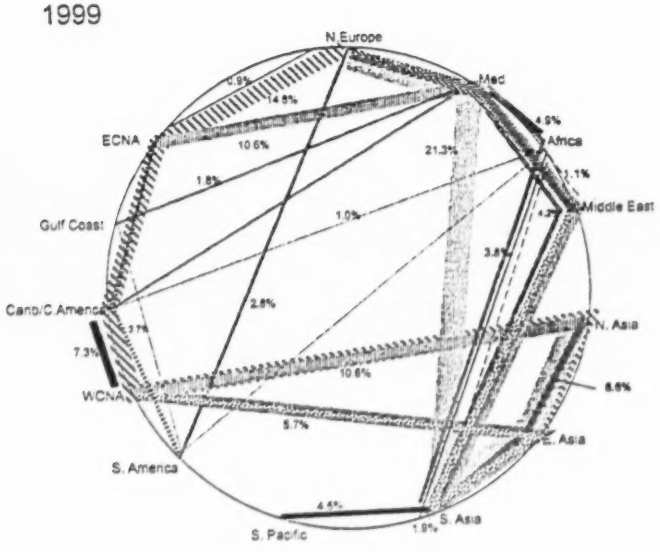


Fig. 4 Expansion of service networks, 1989-1994

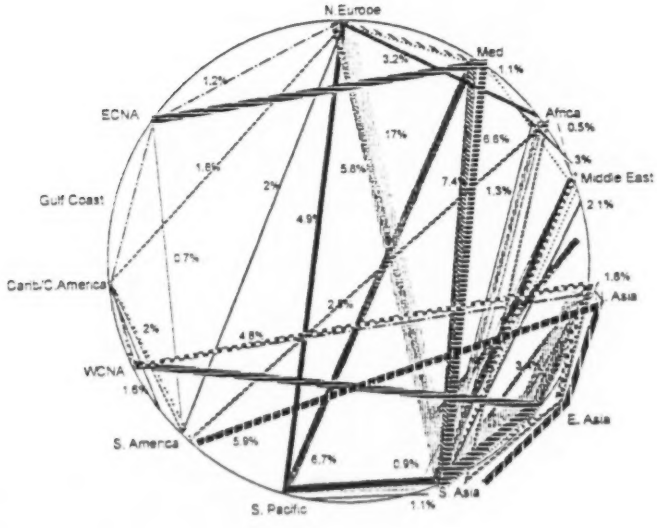
Maersk

1999



P&O Nedlloyd

1999



4% feeder service
7% no route

Fig. 5 Global multi-range networks